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OPERATING SYSTEM-1 (GATE 2023) - REPORTS

OVERALL ANALYSIS | COMPARISON REPORT | SOLUTION REPORT

ALL(17) | CORRECT(10) | INCORRECT(3) | SKIPPED(4)

Q. 1 Have any Doubt ?

Consider a disk in a system, P is the probability of occurrence of page fault on a request to disk. Memory access time is 10 µs and effective access time is 109 µs for this system. Page fault time is 1 ms for this system. The value of P is

A 0.12

B 0.1 — Your answer is **Correct**

Solution :
(b)

$$\text{Effective access time} = (1-P) \times (\text{Memory access time}) + P \times (\text{Page fault time})$$
$$\Rightarrow 109\ \mu s = (1-P) \times 10\ \mu s + P \times 1000\ \mu s$$
$$\Rightarrow 109 = 10 - 10P + 1000P$$
$$\Rightarrow 990P = 99$$
$$\Rightarrow P = \frac{99}{990} = 0.1$$

C 0.05

D 0.01

QUESTION ANALYTICS +

Q. 2 Have any Doubt ?

Which of the following is incorrect?

A External fragmentation not possible in paging.

B Internal fragmentation possible in paging.

C Segmentation does not require memory compaction. — Your answer is **Correct**

Solution :
(c)
External fragmentation possible in segmentation, so it need compaction also.

D On page fault, if page request is valid then data in page table changes on page fault handling.

QUESTION ANALYTICS +

Q. 3 Have any Doubt ?

Consider a system using grouping method to implement free-space-list to keep track of free/ unallocated block of disk. Disk block size is 2 KB and length for address of a location in disk is 8 bytes. Assume, at an instance, 3 disk blocks are used for free-space-list and last block from these 3 block contains only 15 addresses of free blocks. How many blocks are currently free in the system?

A 527

B 524

C 530

D 525 — Correct Option

Solution :
(d)

$$\text{Block size (BS)} = 2\ \text{KB}$$
$$\text{Address length (AL)} = 8\ \text{bytes}$$
$$\text{Maximum addresses can stored in a block} = \frac{\text{BS}}{} = \frac{2\ \text{KB}}{} = 2^8$$

AS 8 B

First block in free-space-list contains $2^8 - 1$ address of free blocks and last address for next block in free-space-list.
Same way second block contains $2^8 - 1$ bytes.
Now third which is last block contains only 15 address.
So, Total free blocks = $(2^8 - 1) + (2^8 - 1) + 15$
= 255 + 255 + 15 = 525

QUESTION ANALYTICS +

Q. 4 Have any Doubt ?

In which of the following situation deadlock will definitely occur?

A Each resource in system has single instance and current resource-allocation graph contains cycles. Your answer is **Correct**

Solution :
(a)
(b) If multiple instance for resources, then cycle is necessary but not sufficient condition for deadlock.
(c) Here, mutual exclusive property not hold, so no deadlock.
(d) Here, no-preemption does not hold, so no deadlock.

B Each resource in system has multiple instances and current resource-allocation graph contains cycles.

C All resources in system are sharable.

D All processes in system have different priorities and high priority process can preempt a lowpriority process.

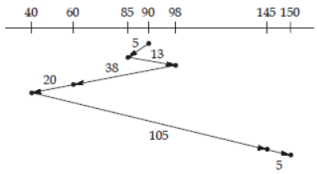
QUESTION ANALYTICS +

Q. 5 Have any Doubt ?

Consider a disk queue in a system contains requests for following tracks:
60, 40, 145, 150, 85, 98
Disk has 200 tracks numbered from 0 to 199. Initially head of disk located at track number 90. Moving of head from one track to its adjacent track takes 1 ms. Disk uses shortest-seek-time-first scheduling algorithm. How much time will require to complete the requests in given queue?

A 186 ms Correct Option

Solution :
(a)
For SSTF, following will be order of request



Total tracks reached = 5 + 13 + 38 + 20 + 105 + 5 = 186
Time for 186 tracks = 1 × 186 ms

B 160 ms

C 180 ms

D 176 ms Your answer is **IN-CORRECT**

QUESTION ANALYTICS +

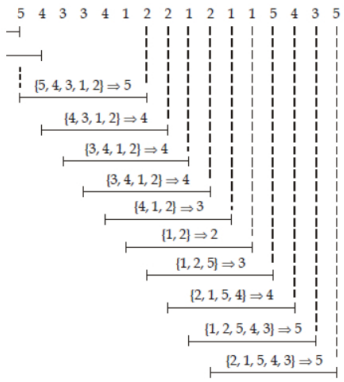
Q. 6 Have any Doubt ?

Consider a system uses working-set model for frame allocations. Let working-set window size is 7. Let following is sequence of virtual page references:
5, 4, 3, 3, 4, 1, 2, 2, 1, 2, 1, 1, 5, 4, 3, 5
Let x and y are minimum and maximum number of elements respectively in a working set on execution of above sequence. The value of $x + y$ is _____.

7 Your answer is **Correct7**

Solution :
7

Working set window (Δ) = 7



Here minimum cardinality working set is {1, 2}, so $x = 2$.
Maximum cardinality working sets have cardinality 5 and they are more than one.
So, $y = 5$
$x + y = 2 + 5 = 7$

QUESTION ANALYTICS +

Q. 7 Have any Doubt ?

Consider a system uses First-In-First-Out (FIFO) page replacement policy. Let following is sequence of virtual page references:
1, 2, 3, 1, 4, 5, 2, 5, 3, 4, 1
If system has 3 frames available then x number of page faults will occur for above sequence. If system has 4 frames available then y number of page faults will occur for above sequence. Assume, initially all frames are empty. The value of $x - y$ is _____.

3 Your answer is **Correct**3

Solution :
3

Number of frames = 3

1	2	3	1	4	5	2	5	3	4	1
		3	3	4	5	2	2	3	4	1
	2	2	2	3	4	5	5	2	3	4
1	1	1	1	2	3	4	4	5	2	3
F	F	F		F	F	F		F	F	F = 9 faults = x

Number of frames = 4

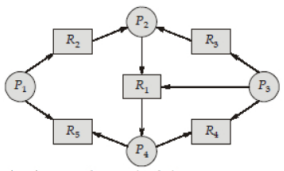
1	2	3	1	4	5	2	5	3	4	1
				4	5	5	5	5	5	1
		3	3	3	4	4	4	4	4	5
	2	2	2	2	3	3	3	3	3	4
1	1	1	1	1	2	2	2	2	4	3
F	F	F		F	F					F = 6 faults = y

$x - y = 9 - 6 = 3$

QUESTION ANALYTICS +

Q. 8 Have any Doubt ?

Consider a system has four processes P_1, P_2, P_3, P_4 and five resources R_1, R_2, R_3, R_4, R_5. At an instance, following is resource allocation graph of these processes and resources:



Let $G(V, E)$ is wait-for graph of above given resource-allocation graph. Which of the following is/are correct?

A G has nodes for P_1, P_2, P_3, and P_4 processes — Correct Option

B G has nodes for R_1, R_2, R_3 resources

C $(P_1, P_2) \in E$ and $(P_3, P_4) \in E$ Correct Option

D $(P_1, P_4) \in E$ and $(P_2, P_4) \in E$

YOUR ANSWER - NA | CORRECT ANSWER - a,c | STATUS - SKIPPED

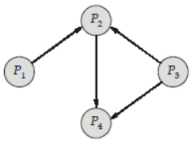
Solution :

(a, c)

In wait-for graph, there is no resource node. So (b) is incorrect.

$P_i \rightarrow P_j$ is edge in wait-for graph iff there exist a resource R_k for which $P_i \rightarrow R_k$ and $R_k \rightarrow P_j$ are edges in resource-allocation graph.

Wait-for graph of above graph:



$\{(P_1, P_2), (P_2, P_4), (P_3, P_2), (P_2, P_4)\} = E$

$\{P_1, P_2, P_3, P_4\} = V$

QUESTION ANALYTICS +

Q. 9 Have any Doubt ?

Which of the following statements is/are correct for frame table in an operating system which uses paging system?

A Frame table maintains allocated frames. Your option is **Correct**

B Frame table maintains free frames. Correct Option

C If a frame is allocated, then frame table has an entry for process id to which it allocated. Your option is **Correct**

D Frame table accessed and modified only by operating system. Your option is **Correct**

YOUR ANSWER - a,c,d | CORRECT ANSWER - a,b,c,d | STATUS - ✗

Solution :

(a, b, c, d)

QUESTION ANALYTICS +

Q. 10 Have any Doubt ?

Consider the following statements regarding contiguous memory allocation methods. Which of the following statement is incorrect?

A There can be the situation where worst-fit algorithm allocates memory to all processes, but not possible for best-fit.

B There can be the situation where next-fit algorithm allocates memory to all processes, but not possible for best-fit.

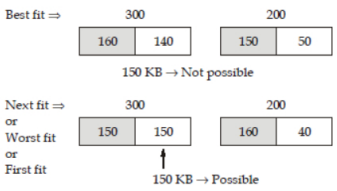
C There can be the situation where first-fit algorithm allocates memory to all processes, but not possible for best-fit.

D None of the above is incorrect Your answer is **Correct**

Solution :

(d)

Processes of size 150 KB, 160 KB, 150 KB in order, with 300 KB and 200 KB memory



QUESTION ANALYTICS +